

Electromagnetism

Magnetic force, magnetic fields, magnetic induction

What is a magnet?

What is a magnetic field?

What happens when you run a current near a magnet?

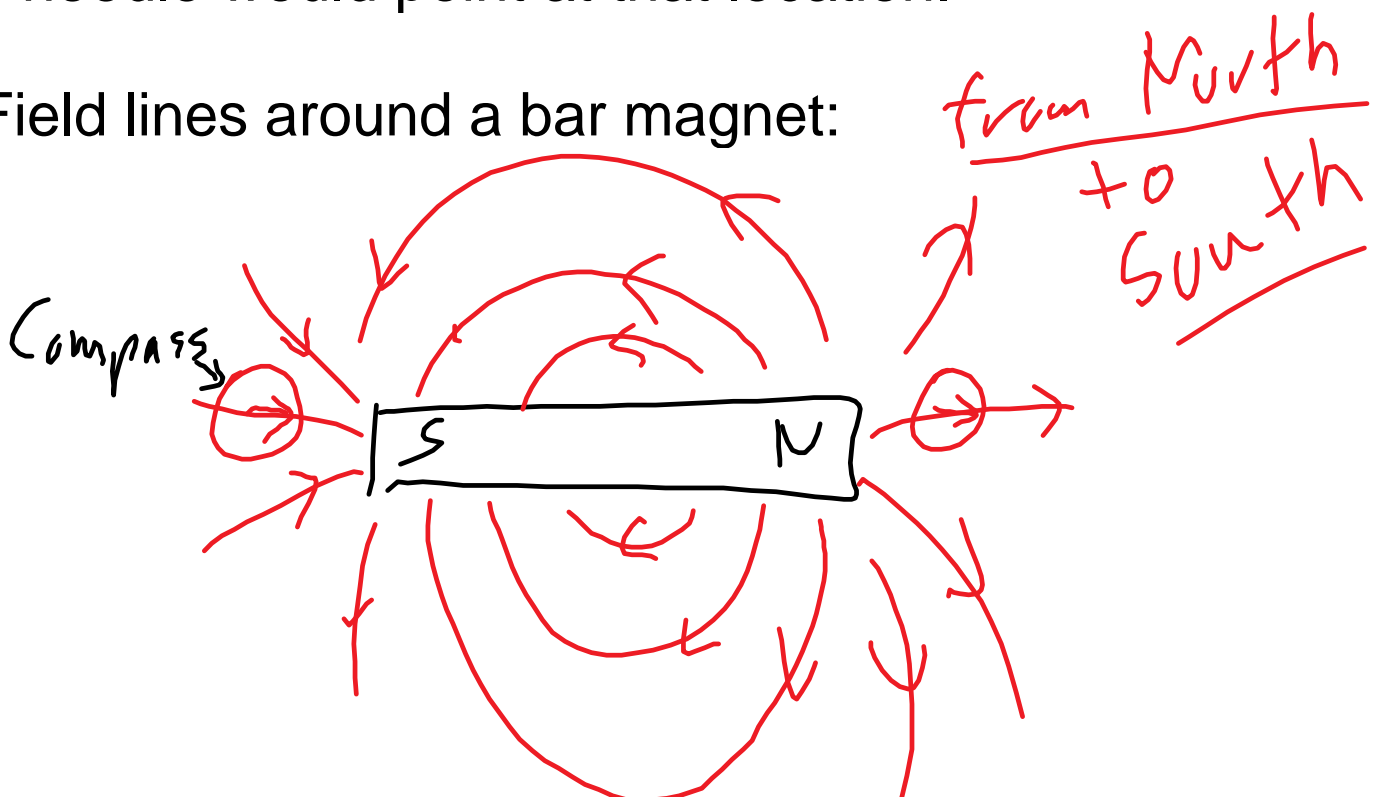
What happens when you alternate a current near a coil of wire?

What does it look like when you put iron filings near magnets and current carrying wires?

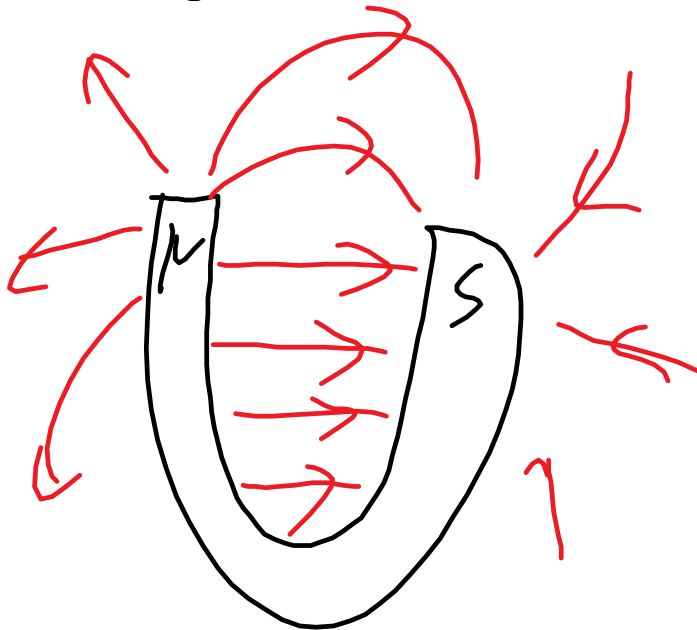
Magnets - Objects that produce a magnetic field.

- Have North and South poles. Opposites attract while like poles repel.
- Magnetic field lines show the direction a compass needle would point at that location.

Field lines around a bar magnet:

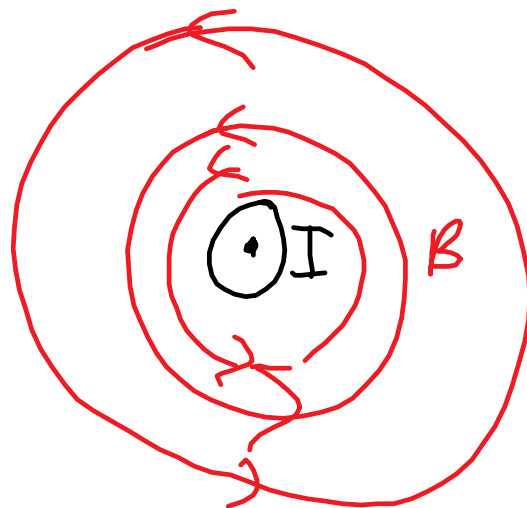


Horseshoe Magnet:



Current-carrying wire:

Current out of the page (circle with a dot) *constant*



$$B = \frac{\mu_0 I}{2\pi r}$$

not
on
data
sheet

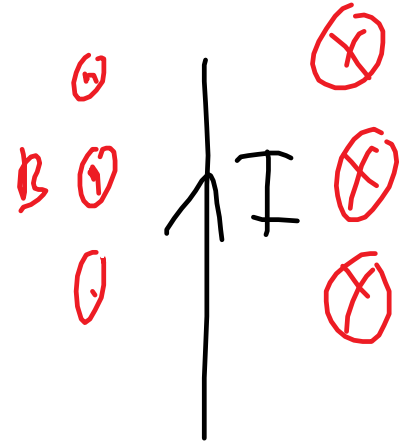
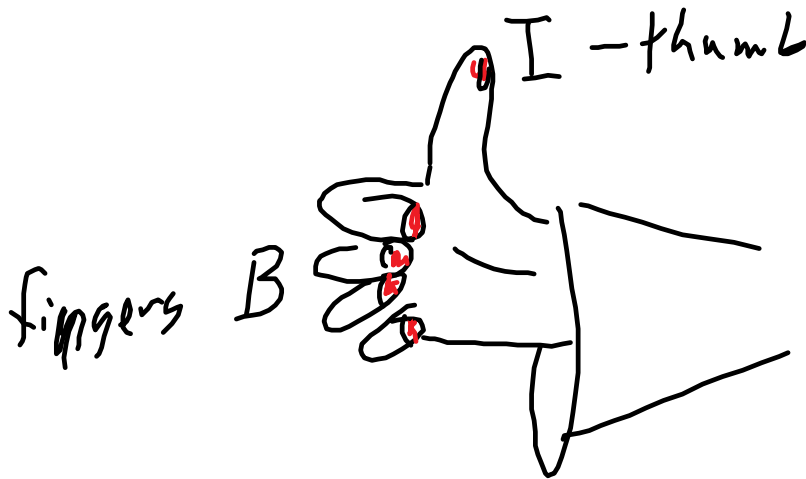
distance to
wire

$$\mu_0 = 4\pi \times 10^{-7} \frac{\text{Tm}}{\text{A}}$$

B is magnetic field

Strength, in Teslas, T.

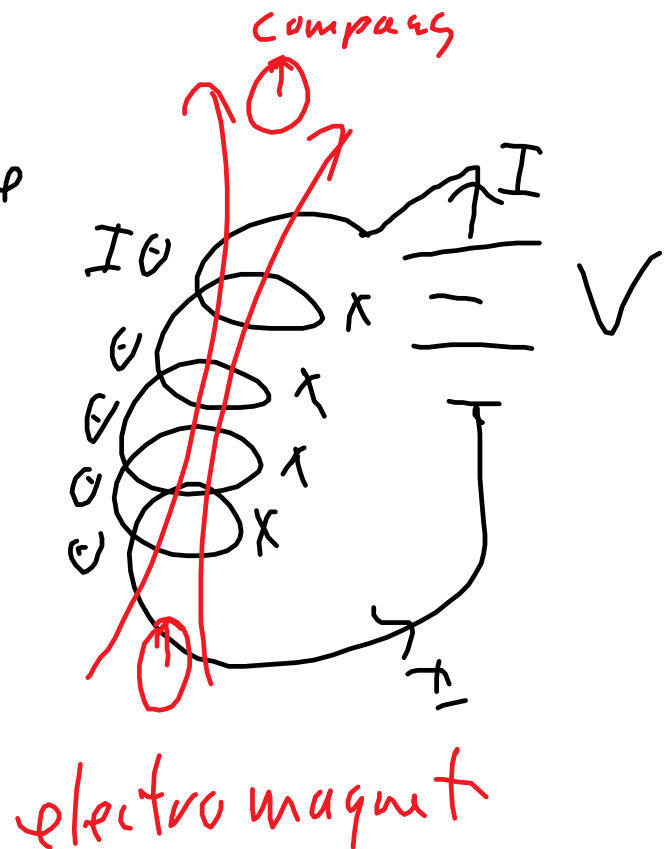
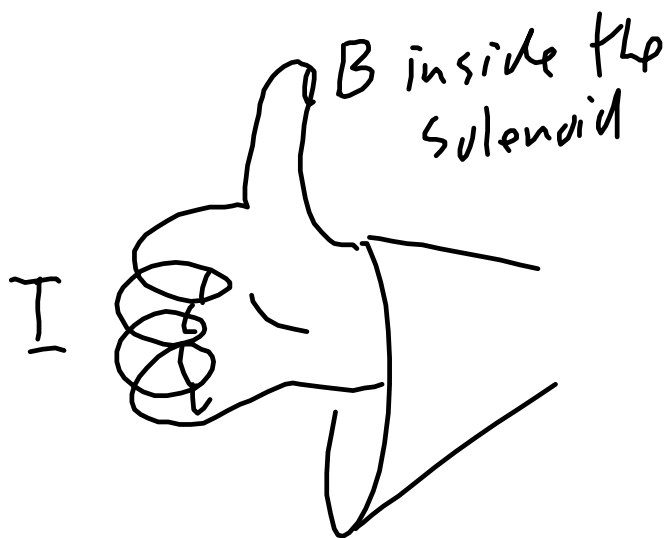
Right hand rule #1



Solenoid

Coil of wire with a current.

Right Hand Rule #2

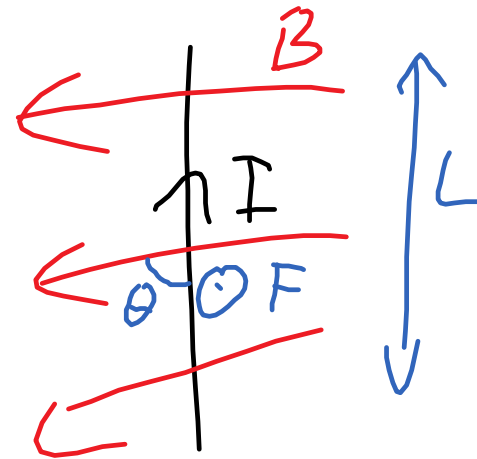
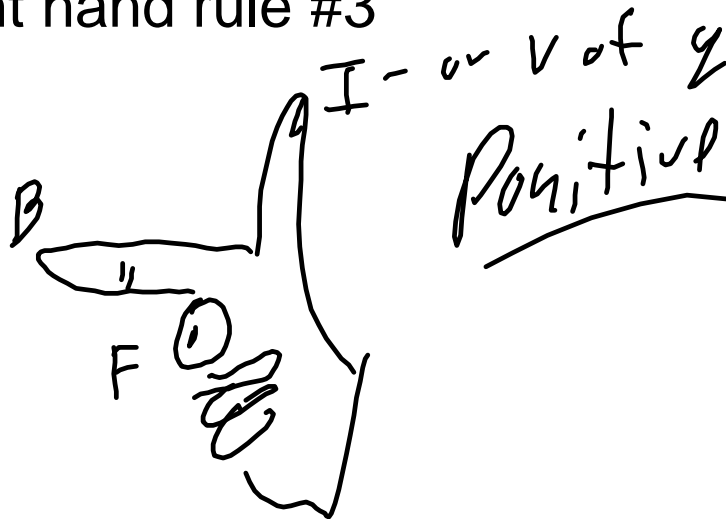


Magnetic force

If you have moving charge

Either q moving at v or current I in a wire Length L , the charge and the wire experience a force perpendicular to both the magnetic field and the v or I .

Right hand rule #3



$$F = I \times B L$$

$$F = B I L \sin \theta$$

$$F = q v B \sin \theta$$

Giancoli P532 Q1-9

P533 Problems 1-13 odds